

# The Canadian Entomologist

LXIX.

ORILLIA, MAY, 1937

No. 5

## NOTES ON THE BIOLOGY OF TWO PANURGINE BEES.

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### ***Calliopsis andreniformis***

*Calliopsis andreniformis* is a panurgine bee that inhabits much, if not all, of the eastern area of the United States. It is a small inconspicuous species. The females are about 8 mm. in length, exclusive of antennae, quite robust, general color gray, abdomen fasciate, maculation luteous. The males are more slender, smaller, maculation yellow, face and legs entirely yellow.

Nothing definite seems to be known of the habits of this species. Like all panurgine bees it nests in burrows underneath the ground and hibernates as a larva.

June 14, 1930, an exceedingly active colony of these bees were observed mining in hard trodden ground in front of a suburban grocery in eastern Sioux City, Iowa. Small mounds were being thrown up over an area nearly a yard square. These mounds were seen to bulge every few seconds as the diggers below pushed a fresh supply of loosened soil toward the surface. These mounds when complete measured perhaps an inch in breadth and were usually not very convex.

A few days later another colony was discovered not far from the first and in course of time several more were recognized. Hard ground and scanty vegetation seems to afford a favorite site for the nesting location.

For three years this species was under observation and study, then for some unknown reason colonies could not be found where they had formerly been populous.

The activity of a colony begins quite promptly about June 10th of each year. This date marks the emergence of the hibernating larvae. The chosen sites present a lively aspect almost from the very first. The numbers of the adults is never very great but their rapid flying motions give an observer an impression of many bees and it would be easy to overestimate their numbers.

Their habits on the wing deserve particular mention. The males have a peculiar habit of dropping to earth suddenly and then standing perfectly motionless for some time unless disturbed by some other bee. They show but little interest in the mounds near by but are keenly alert to what is transpiring, always ready to take part in any skirmish that may start. They occasionally make short excursions down open galleries of the colony but these appear to be merely curiosity trips and may have no significance. On rare occasions I have fancied matings were taking place but the whirlwind actions of the fliers make their motions difficult to translate.

The females, when not engaged in digging, are almost constantly on the wing, once in a while dropping to the earth for a rest. Normally they fly close to the surface, so close in fact that the currents of air from their wings stir up miniature whirlwinds of dust from the ground just beneath them. They have a

curious habit of hovering, maintaining themselves in a fixed spot in the air for a number of seconds. While thus hovering they often reverse ends, repeating the reversal again and again. Then they may circle to some other location and repeat. Sometimes they may rise higher and higher during the hovering until they are six or eight inches above the ground. It should be stated that it is very difficult to follow with the eye the flight of any individual bee, so rapid and intricate are their airy movements. While excavation is in progress the females often run about the surface, crowding into the piles of fresh earth here and there, finally finding their own gallery, into which they force themselves and immediately dive out of sight.

A number of excellent opportunities offered themselves to watch the operation of digging. When a gallery is started the bees are compelled to rotate constantly as they loosen the hard earth with their jaws, in order to produce a circular hole. At one time, while excavating a gallery with my knife I came across a busy female hard at work at the depth of two inches. Strangely enough she paid no attention to me although part of her body was exposed. As she passed the loosened earth from beneath her body I brushed it away with my knife blade and kept pace with her. She rotated as she descended, boring a very evenly circular hole about one sixth of an inch in diameter. She was followed in this manner for nearly an inch, when she sensed something wrong, backed out of the burrow and flew away. Some of these diggers were watched with a hand lens and the close observation did not appear to annoy the busy insects.

Some of the colony galleries did not have a mound of earth at the top, the opening exposed, the excavation possibly made by some other species of bee. But nothing could be learned regarding this matter.

During the nesting season the digging is carried on with tireless energy. Each female must dig a number of nests since each nest provides for only a single egg. In order to learn the character of the underground life-history of these interesting bees, a series of explorations of colony territory was undertaken and continued year after year as circumstances permitted. The best results were obtained by the use of a broad bladed putty knife. A well several inches deep was dug near the center of the colony area and gradually a smooth perpendicular was secured, with a frontage of perhaps a foot. By carefully slicing this wall with the blade the conditions of the various nests were revealed as they were reached. It was learned that the galleries were generally three or four inches in depth, nearly always perpendicular and ending below in a globular cell larger than the gallery itself, or about a quarter of an inch in diameter. When completed the cell has a most beautiful polish, the process of finishing giving it a dark, almost black surface, as smooth as glass.

Within this cell the mother bee gradually accumulates a ball of yellow pollen, bringing this material in a little at a time, forcing her way through the cap of loose earth at the top of the burrow. The pollen ball is perfectly spherical, about 5 mm. in diameter. The source of the pollen was not determined. Hop clover, growing near one of the colonies, was swept while in bloom and at one time 30 males and one female were captured. As far as known the males do not contribute to the stores in the nests.

Upon the pollen ball an egg is placed. This egg is milky white, translucent, slightly arcuate, with rounded ends. It is nearly 2 mm. in length with a diameter about one third the length. The egg period is unknown, since as soon as the cell was opened or the pollen ball with the egg in situ removed for rearing, the pollen would at once begin to mold. Admission of outside air was fatal to the normal cell conditions and no method was devised that would enable the progress of the egg development to be watched. For the same reason the growth of the larvae to maturity has not been definitely ascertained, but is believed to be about three weeks.

The *Calliopsis* hibernates as a larva. There are indications that very few larvae perish during the winter. The larvae are entirely motionless so it was easy to secure good photographs of them. They are strongly arcuate, with very prominent abdominal segments, color a light yellow.

The following spring, about May 20th, pupal forms begin to appear. This was the first date of finding the pupae. From this time pupation proceeded rapidly until by June 1st larvae were difficult to find. Many larvae were dug and placed in individual cells and the time of emergence noted. 18 days was the average length of the pupal period. The pupae are quite active as soon as they shed the larval skin, with constant abdominal motions, especially when exposed to light. This activity is noticeable through the entire pupal period, becoming still more pronounced as it nears maturity. The pupal eyes begin to turn pink within a day after the pupal life begins and the color gradually spreads over the entire body until it is black. The abdominal segments become better differentiated as the color darkens.

Until the end of June a few adults may be seen flying about the colony area and some have even been observed as late as the middle of July.

Several larvae were unearthed that were infested with multitudes of mites, determined by Dr. H. E. Ewing as *Pigmephorus* sp.

*Sphecodes* sp. has been observed flying about the colony areas, alighting at times.

### ***Holcopasites stevensi***

One of the problems that appeared when the study of the life history of *Calliopsis andreniformis* was begun, arose from the fact that another panurgine bee, *Holcopasites stevensi*, was always present in the colonies of the *Calliopsis* and the relations of the species were unknown. It was evident that the *Holcopasites* was either a parasite of the other, or an inquiline, living perhaps in the nests of the *Calliopsis*. The studies of the two species did little to solve the mystery. The habits of the *Holcopasites* are very similar to the other except that they were never seen in the act of digging. It is my belief, unsupported by known facts, that *H. stevensi* is an inquiline, living more or less at the expense of the other.

*Holcopasites stevensi* is a small panurgine bee of the *Nomada* family. It can be briefly described as having a black head and thorax, maculate with tufts of white hairs, abdomen red, with small tufts of white hairs on each segment except the apical, a row of dark spots dorsally. Its form is robust, about 5 mm. in length. The species is always present in the colony areas of the *Calliopsis*, sometimes in considerable numbers, and acts very much at home. At certain times during the spring the species has been seen entering the burrows of the *Calliopsis*. Excava-

tions in the colony area shed no light on the problem of the interrelations of the two species, for the larvae and pupae of both have been found in about the same relative positions.

On July 3, 1930, adults of *Holcopasites* were busy hunting open holes and seemed anxious to explore any of them. As a rule, during the nesting season, they spend little time standing still but are usually running about from mound to mound, inquisitively. June 17, 1931 an adult was seen to drop down by an open hole and entered without any hesitation. Six or eight seconds later a male *Calliopsis* also entered. Ten seconds afterwards the *Calliopsis* came out, closely followed by the other. Soon after another *Holcopasites* disappeared in the hole and remained so long that its emergence was not noted. So many observations of this nature have been made in the course of this study that one can adopt almost any theory of relationship of these two species and find basis for any one of them. Nest excavation brought out no facts that would clear up the mysterious life history of the *Holcopasites*.

June 20, 1931, a number of individuals of this species were discovered at 7 p.m., near a nesting colony, ready for the night's repose. Within a small area a dozen or so were gathered. They all perched near the tip of slender grass blades, head downward, two on a single blade in some cases. This habit had been observed before but only now and then when a single bee was located in this manner.

As has been said, none of this species was seen to be actually doing any excavating. Careful investigation of the nests uncovered scores of larvae of both this species and the *Calliopsis*, at the same depth and under much the same conditions. The larvae of the *Holcopasites* is only slightly arcuate, is smaller than the *Calliopsis* and ovate, pale yellow. These larvae are motionless. The numbers of *Holcopasites* are much smaller than of the *Calliopsis*.

One fact regarding the *Holcopasites* is outstanding. While the *Calliopsis* began to pupate about May 20th, the *Holcopasites* showed no sign of pupation until June 10th after which date the pupae began to appear rapidly. The pupal state was slightly longer than that of the *Calliopsis* or about 20 days.

June 13, 1932, many *Holcopasites* were very busy, flying about the nearly deserted *Calliopsis* colony, not only alighting but looking for open holes and even penetrating mounds. July 8, 1932, a *Holcopastes* was seen to force its way down into a gallery, remaining below for two minutes. During July a few of these bees were usually to be seen about the colony area, moving about listlessly with no apparent interest in the surroundings.

#### A PROGRESS REPORT ON THE MICROLEPIDOPTERA OF SOUTHERN INDIANA, AND THEIR PARASITES<sup>1</sup>.

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Since 1930 a study has been made of the lepidopterous stem borers and leaf rollers breeding on deciduous fruit trees as well as on uncultivated plants in or near orchards which have served as sites for Oriental fruit worm parasite liberations. Parasites of these lepidopterous larvae have been reared as an im-

1. Contribution from the Department of Entomology, Purdue University Agricultural Experiment Station.

portant phase of the study. The objects of these studies include a record of the Microlepidoptera and their hosts and parasites, and possible alternate hosts of introduced parasites of the Oriental fruit worm.

Identifications of much of this material were made as follows: Microlepidoptera by Annette Braun, Cincinnati, O., and Carl Heinrich and August Busck of the U. S. National Museum; parasites by Grace Sandhouse, L. H. Weld, R. A. Cushman, C. F. Muesbeck and A. B. Gahan of the U. S. National Museum. The numbers accompanying the list of the Microlepidoptera are those given in Barnes and McDunnough's Check List of Lepidoptera of Boreal America.

### **Pyrus malus**

Through rearings of the species listed below the following information of possible value was gathered:

5737. *Psorosina hammondi* Riley is general in Southern Indiana on apple. The larvae are light brown or greenish and are found infesting the upper sides of the leaves, for the most part, and with a light web spun over them from one margin of the leaf to the other. The larvae skeletonize the leaves in feeding and the scale-like eggs are laid more often on the under side of the leaf in the axil of the veins. Examinations reveal that these may be present on the same leaf continuously from July 15 to Sept. 1. This insect often defoliates most of the tips of the twigs of trees in young or unsprayed orchards. All sizes of the larvae may be found after early summer. The parasite *Metcorus tetralophae* Mues. was reared from a collection made July 6, 1932. From this collection 34 adults of the host emerged and two parasites of the above named species. There was also one dipterous parasite as yet undetermined.

8025. *Ornix geminatella* Pack. was reared from a collection of 61 infested apple leaves taken at Bedford Aug. 19. Nine adult moths and 14 parasites emerged between Aug. 15 and 29. From these, *Elasmus albicoxa* How., *Horismenus violaceus* (Ashm.), and *Cirrospilus nigrivariiegaius* Gir. were the parasites identified. The larvae of this leaf miner leave the mines to spin cocoons and pupate.

7873. *Tischeria malifoliella* Clem. infested leaves were collected Aug. 8. From 39 infested leaves eight adult moths emerged between Aug. 12 and Sept. 1. In addition, 18 adults of *Horismenus violaceus* (Ashm.) and *Sympiesis nigripes* (Ashm.) emerged.

*Miscellaneous Notes.* In two dried leaves found hanging from a broken twig on an apple tree in August were found several hundred adults of *Halictus zephyrus* Smith. These were clustered together much like a swarm of honey bees.

An attempt to rear a leaf roller larva of apple collected Aug. 10 at Bedford yielded on Aug. 15 a parasite adult *Hyposoter annulipes* Cress.

### **Rubus alleghenensis**

Fifteen mined leaves of this plant, collected Aug. 24, produced two adults of an unidentified leaf miner and four parasites of *Pleurotropis lithocolletidis* (Ashm.) and *Derostenus variipes* Craw.

From a leaf roller collected with a leaf of *R. alleghenensis* Aug. 4, was reared one *Chlorolycorina scitula* (Cress).

Four leaves infested with (7185) *Ancylis comptana* Walsh and Riley, were collected at Bedford Aug. 3, from which three adult moths emerged and one *Perilampus fulvicornus* (Ashm.).

#### **Vitis sp.**

From the leaves of *Vitis* sp. collected at Bedford Aug. 1 and containing leaf miners, emerged four adults of *Mesochorus* sp. between Aug. 9 and 17.

#### **Prunus serotina**

Four adults of (6274) *Clechia serotinella* Busck and several *Cerceris compare* Cress. were reared from a collection of 11 infested twigs of *Prunus serotina* made near Mitchell on July 2. From another collection from this plant of the same host an adult parasite, *Rogas quebecensis* Prov. emerged.

#### **Bidens frondosa**

Twenty-three adults of (7025) *Epiblema oriosana* Clem. were reared from one collection of stems of *Bidens frondosa* made Aug. 5. This emergence occurred between Aug. 8 and Sept. 10, with the peak on Aug. 22. From this same collection 37 parasites emerged between Aug. 10 and Sept. 1. Several plants of *Bidens frondosa*, which were observed from time to time, were killed by this stem borer before the plant produced seed in the fall. A collection of plant stems made Aug. 18, yielded five adults of the host between Aug. 22 and Sept. 1, and 22 parasites between Aug. 22 and 29. From the two collections the following parasites were identified:

8 *Macrocentrus pallisteri* DeGant, 20 *Microbracon caulicola* Gahan, 1 *Pristomerus ocellatus* Cush., 1 *Bassus simillimus* (Cress.), 1 *Eupelmus allymi* French and 1 *Eucoilidea* sp. (a hyperparasite of a dipterous parasite).

#### **Cirsium spinosissimum**

Fifteen adults of (6785) *Polychrosis carduana* Busck, (6828) *Hedia cyanana* Mtf., and (5111) *Pyrausta pertextalis* Led. were reared from the rolled terminal leaves and buds of *C. spinosissimum*. Emergence occurred between July 25 and Aug. 12 from the collection made about July 13 at Bedford. Between July 30 and Aug. 3, three *Bassus annulipes* (Cress.), and six unidentified Diptera emerged.

#### **Rosa rubiginosa**

(6828) *Hedia cyanana* Mtf. was reared from a collection made of rolled leaves of *Rosa rubiginosa* at Bedford July 24. Six adults of *Hedia cyanana* Mtf. and fifteen parasites, *Epirhyssalus atriceps* (Ashm.), emerged from July 26 to Aug. 3. Other rearings of the rolled leaves of this plant made in July and August yielded adults of the parasite *Goniozus platynotae* Ashm. The host of this latter parasite was not reared from this collection but no doubt was either *Hedia cyanana* Mtf. or (7238) *Grapholitha packardi* Zeli.

#### **Agrimonia parviflora**

Four adults of (6199) *Anacamptis agrimoniella* Clem. and 31 adults of a parasite, *Copidosoma* sp. (probably *lymani*) were reared from a collection of 25 leaves of *Agrimonia parviflora* brought into the insectary on Aug. 4.

#### **Rhus toxicodendron**

*Clostocerus tricinatus* Ashm. adults, as well as those of *Phigalia* sp. and Entedoninae? genus (probably new), were reared from a collection of 80 in-

infested leaves of *Rhus toxicodendron* made near Mitchell on Aug. 4. The host of these parasites was (7961) *Camararia guttifinitella* Clem., a leaf miner. Another collection of the mined leaves of the same plant was made near Mitchell on July 3, and from these leaves were reared *Pleurotropis lithocolletidis* (Ashm.) and *Rhiconopeltoidea amsterdamensis* Gir.

### *Rhus typhana*

(5614). *Meroptera pravella* Grote were reared from collections of the infested leaves of *Rhus typhana*.\* From collections of leaves of this plant made on July 21, and infested with the larvae of an insect which rolls the leaves from the very point of the tip back toward the base of the leaves in a tight roll, two parasites, *Apanteles ornigis* Weed and *Microbracon politiventris* (Cushman), were reared.

### *Sassafras variifolium*

Eight adults of (7361) *Cacoecia rosaceana* Harris emerged from eight rolled leaves of *Sassafras variifolium* on July 9.

No parasites of this species were reared.

The following additional Microlepidoptera rearings were made:

8079. *Sythris impositella* Zell. was reared from *Aster* sp. and emerged June 1932. These adults overwintered in the pupal cell on the host plants which were collected in September 1931. Larvae feed within the leaf but have a funnel-shaped web at the entrance of the mine.

8042. *Gracilaria rhoifoliella* Cham. was reared from *Rhus* sp. collected at Bedford, emerging June 12, 1932. This insect rolls the tips of the leaves from the apex toward the base in a tight roll.

3554. *Palthis asopialis* Gn. was reared from *Bidens frondosa* collected at Bedford, and emerged Sept. 1 to 10. This insect is a stem borer. *P. asopialis* Gn. was also collected in Orange County, Florida on *Erechtites heircifolia*.

4921. *Desmia funeralis* Hbn., a leaf roller, was reared from *Vitis* sp. at Bedford, and emerged Aug. 10, 1932.

6353. *Anarsia lineatella* Zell. was reared from *Prunus persica* at Bedford, and also from collections made at Edinburgh, Boonville, Poseyville, Linton and New Amsterdam. The adults emerged in July and August.

6800. *Exartema foedanum* Clem. was reared from *Rubus alleghenensis* at Bedford and emerged July 18, 1932.

7238. *Grapholitha packardi* Zell. was reared from *Rosa rubiginosa* at Bedford and emerged Aug. 8, 1932. This insect is a leaf roller.

6012. *Mompha definitella* Zell. was reared from *Oenothera biennis* at Bedford, and emerged Sept. 1930. This insect is a stem borer.

938. *Eubaphe immaculata* Reak was collected at light at Bedford in August and also at Orlando, Florida, in February and March.

2952. *Tarachidia erastroides* Gn. was collected at light near Bedford Aug. 19, 1930.

6894. *Eucosma ridingsana* Rob. was collected at light near Bedford Aug. 15, 1930.

7270. *Carpocapsa pomonella* Linn.

\*This determination is doubtful, the food-plant of *M. pravella* being *Populus*. The sumac-feeder is the very similar-appearing *Salebria semiobscurella*. Editor.

5720. *Euzophera semifuneralis* Wlk. was reared from *Pyrus malus*, collected at Bedford, Mitchell and Vincennes in April 1932. This insect overwinters on tree trunks beneath bands and emerges in the spring. The larva usually enters the tree trunk at a recent injury, at a crotch or knot hole. It feeds on the green cambium tissue of the tree.

7900. *Phyllonorycter malimalifoliella* Braun was reared from *Pyrus malus* at Bedford, Mitchell and Orleans, Indiana, and Bentonville, Arkansas, during June, July and August. The mines seem to be more prevalent in the shaded part of the apple tree and toward the top of the tree. As many as five mines of the insect have been found on a single leaf.

6203. *Gelechia cercerisella* Cham. was reared from *Cercus canadensis* in 1930 at Bedford.

6041. *Aristotelia roseosuffusella* Clem. was collected at light near Bedford during August and September.

7152. *Thiodia crispata* Clem. was trapped in apple ferment, a bait prepared of apple juice and used for the trapping of *Carpocapsa pomonella* at Bedford, August 1930.

? . *Olethreutes cespitana* Hbn. was taken at light near Bedford.

3835. *Euacidalia ossularia* Hbn. was taken at light near Bedford in 1930.

3002. *Paectes oculatrix* Guen. was taken from apple ferment bait near Bedford Aug. 30, 1920.

4912. *Egesta eripalis* Grote was taken at light near Bedford on Aug. 24, 1930.

5259. *Hypsopygia costalis* Fabr. was taken at light near Bedford Aug. 8, 1930.

6981. *Epiblema strenuana* Walk. was taken from apple ferment near Bedford, Aug. 24, 1930.

6854. *Eumaroza malachitana* Zell., a leaf roller of *Diospyrosa virginiana*, emerged Sept. 15, 1931, at Bedford.

? . *Cymolomia feriferana* Walk. was reared from *Hydrangea* sp. in 1931 at Bedford. The larvae of this insect are most noticeable during May and June and roll new leaves of the host plant together in a tight container. They pupate in the nest. This insect emerges, as does the codling moth, with the exuvia sticking in the opening made to gain exit from the nest.

7316. *Sparganothis sulfureana* Clem. was collected at a light near Bedford, Aug. 19, 1931.

7062. *Thiodia imbricata* Fer. was collected at a light and in apple ferment in August, 1930, near Bedford.

7683. *Plutella maculipennis* Curt. was taken near Bedford at light in Sept. 1931.

8120. *Bedellia somnulentella* Zell. was reared from *Ipomoea hederacea* collected at Bedford, and emerged in September, 1930. The larvae eat large irregular holes in splotches in the leaves, only the hyaline cuticle of the leaf surface being eaten. The larvae spin a web over the leaf surface, beneath which they feed.

. *Gnorimoschema* sp., a new species, was reared from *Solanum carolinense* and emerged in June, 1931, at Bedford.

6122. *Gnorimoschema gallaesolidaginas* Riley was reared from *Solidago* sp.,

collected near Bedford, and emerged Oct., 1931.

6380. *Dichomeris ligulella* Hbn. was collected near Bedford, July 8, 1934.

8080. *Scythris eboracensis* Zell. was collected at Bedford on July 6, 1931.

5145. *Pyrausta phoenicealis* Hbn. was collected, overwintering on the tree trunk of apple tree, in January, 1932.

5372. *Crambus teterrellus* Zicken was collected in pasture at night on July 4, 1930.

5384. *Crambus mutabilis* Clem. was collected at apple ferment bait near Bedford on Aug. 20, 1930.

5012. *Nomophila noctuella* D. & S. was collected in apple ferment near Bedford on Aug. 20, 1930.

4933. *Diastictis argyralis* Hbn. was collected at a light near Bedford in 1930.

5025. *Loxostege similis* Guen. was collected at a light near Bedford in August, 1930.

6873. *Phaenocarpa niveiguttana* Gr. reared from *Sassafras verifolia* near Bedford, Orleans, and Mitchell.

7487. *Phalonia oenotherana* Riley was reared from *Oenothera* sp. near Bedford and emerged Aug. 5, 1932.

3012. *Sarothripus revayana lintnerana* Scop. was reared from *Salix* sp. collected near Bedford and emerged Sept., 1932.

7159. *Gypsonoma salicicolana* Clem. was reared from *Salix* sp. collected near Bedford and emerged in August, 1932.

7253. *Ecdytolopha insitiana* Zell. was reared from *Robinia pseudoacacia* collected near Bedford and emerged in September, 1932.

6787. *Polychrosis vernoniana* Kearf. was reared from *Vernonia novboracensis* collected near Bedford and emerged Aug. 26, 1932.

7866. *Tischeria heliopsisella* Cham. was reared from *Ambrosia trifida*, collected near Bedford and emerged in July, 1932.

7941. *Lithocolletis cinnamomea* Cham. was reared from *Quercus* sp. collected near Bedford and emerged Aug. 1, 1932.

7877. *Lithocolletis fitchella* Clem. was reared on *Quercus* sp., collected near Bedford and emerged July 27, 1932.

7947. *Lithocolletis quercivorella* Cham. was reared from *Quercus* sp. collected at Bedford and emerged Aug. 6, 1932.

5737. *Canarsia hammondi* Riley was reared from *Juglans nigra* collected near Bedford, and emerged Aug. 26, 1932.

7886. *Lithocolletis lucidicostella* Clem. was reared from *Acer* sp., collected near Bedford and emerged Aug. 8, 1932.

*Grapholitha molesta* Busck was reared from peaches and apples and is common all over the state.

Several rearings, made by B. Elwood Montgomery<sup>1</sup> in 1931, may be added to this list since his work is a part of the whole problem. The following Lepidoptera reared at that time and not duplicated since are:

2956. *Tarachidia candefacta* Hbn.

<sup>1</sup>Preliminary Studies of Insect Parasites in Indiana. Canadian Entomologist, vol. 65, p. 85, 1933.

- 6109. *Gnorimoschema banksiella* Busck.
- 6116. *Gnorimoschema lavernella* Cham.
- 6284. *Gelechia nundinella* Zell.
- 6478. *Depressaria heracliana* DeG.
- 6811. *Exartema feriferanum* Walker.
- 7390. *Argyrotaenia velutinana* Walker.
- 7731. *Atteva aurea* Fitch.

The list below gives those which were reared by Montgomery in 1931 but to which information has since been added.

- 4921. *Desmia funeralis* Hbn.
- 7316. *Sparganothis sulfureana* Clem.
- 6122. *Gnorimoschema gallaesolidaginis* Riley.
- 6873. *Phaecasiophora niveiguttana* Grt.
- 7026. *Epiblema strenuana* Clem.
- 7270. *Carpopapsa pomonella* Linn.

### THE COLEOPTERA OF CANADA'S EASTERN ARCTIC.\*

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The present paper is an outgrowth of a collecting trip made by myself to the eastern arctic during the summer of 1935. The month of August was spent in the vicinity of Lake Harbour, Baffin Island, and brief stops were made at Port Burwell, Que., at Craig Harbour, Ellesmere Island, and at Pangnirtung and Clyde, Baffin Island. Results were satisfactory, considering the difficulties which the collector must experience in the region, and this success was due largely to indispensable aid received from Major D. L. McKeand of the Lands, Northwest Territories and Yukon Branch, Department of the Interior, and from Mr. James Bell and Mr. Nelson Adams of the Hudson's Bay Company, Lake Harbour.

The area considered here includes the south shore of Hudson Strait and Baffin, Devon, and Ellesmere Island, as well as the innumerable smaller islands situated in the same general region. The entire area is truly arctic. Its southernmost parts are situated well beyond the northern limit of the wooded country, and its insect fauna is very much more limited than the rich and varied fauna occurring on the borders of the wooded area. The predominant insect group is the order Diptera which is much better represented than any other both in number of individual insects and in number of species. The order Hymenoptera stands next. Except for a few Tenthredinoidea and Bremidae, all of the Hymenoptera belong to the parasitic groups. The Lepidoptera is well represented and ranks third. The members of these three orders, together with a few species of Collembola and the parasites of warm blooded animals, extend into the northernmost parts of the region and make up virtually the entire insect fauna of the areas north of Baffin Island. The order Coleoptera is the only other well represented in the eastern arctic. My own collecting on the shores of Hudson Strait produced twenty species of Coleoptera, two of Trichoptera, two of Ephem-

\*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

1937  
1931  
croptera, one of Heteroptera and three of Homoptera. As regards the Coleoptera, it seems probable that all the species of the entire region occur in Hudson Strait localities and that the fauna changes to the north only as individual species disappear. The following list is probably fairly complete. It includes twenty-eight species of which at least three occurred adventitiously. Like other arctic lists, it shows the prevalence in the arctic of ground-dwelling and aquatic predatory forms and the strong holarctic tendency in the distribution of the species. It also offers evidence as to the essentially European nature of the Greenland beetle fauna.

The only paper that has been published on the beetles of the region is Blair's list of ten species taken at Port Burwell and Akpatok Island (1933, Ann. and Mag. Nat. Hist. (10) XII, 93-96). A number of additional records are to be found in the following references: Harrington, 1890, Can. Ent. XXII, 190; M'Lachlan, 1879, Jour. Linn. Soc. Zool. XIV, 107; Embr. Strand, 1905, Rept. Second Norwegian Arctic Exp. in the Fram, No. 3, 5; Langstaff, 1936, Ann. and Mag. Nat. Hist. (10) XVIII, 532. The following list is based on these published records, my own collections, and a number of specimens collected in Hudson Strait localities by Mr. Frits Johansen, in southern Baffin Island by Mr. J. Dewey Soper, and at Pond Inlet by Reverend John Turner. Determinations were made by myself except where otherwise stated. I have attempted to outline the known distribution of each species in the list by adding records from our collection and the literature and have used especially Blair's Greenland list (1930, Ann. and Mag. Nat. Hist. (10) V, 399), Bowditch's Mt. Washington list (1896, Psyche VII, suppl. II, 1-11), and Sherman's Labrador list (1910, Jour. N.Y. Ent. Soc. XVIII, 173-197). The Ungava Bay records in the last have not been included in the following list because they are obviously based largely, if not entirely, on collections made in the subarctic region in the vicinity of Chimo. All records in the list below are based on material in the Canadian National Collection except where stated otherwise.

Following are some brief notes respecting the localities cited in the list. The localities situated on the south shore of Hudson Strait, listed from east to west, are Cape Chidley, Port Burwell, Stupart Bay, Wakeham Bay, and Cape Wolstenholme. Cape Digges is situated on an island near Cape Wolstenholme. Akpatok Island and Nottingham Island are in Hudson Strait, the former in Ungava Bay, the latter at the western extremity of the strait. Lake Harbour is situated on the north shore of the strait at longitude 69°52'. Bowman Bay is located on the western coast of Baffin Island at the southern extremity of Foxe Basin, and Nattilling Lake is in the interior of the island on the arctic circle. On the east coast of Baffin Island are located Pangnirtung at latitude 66°08', Clyde at 70°26', and Pond Inlet at 72°40'. On the eastern coast of Ellesmere Island are situated Cocked Hat Island and Alexandra Fjord at latitude 78°48', Discovery Bay at 81°40', and Floeberg Beach at 82°21'.

LIST OF SPECIES.

*Nebria* sp. Lake Harbour. This species is very closely allied to *bifaria* Mann. but differs in having the femora constantly black. It is possibly this species that Harrington records from Cape Chidley as *Nebria sahlbergi* Fisch.

*Cryobius arcticola* Chd. (Det. P. J. Darlington, Jr.), Port Burwell, abundant.

This is undoubtedly the same species as that recorded as *Cryobius mandibularis* Kby. by Blair from Port Burwell and Akpatok Island, and it is probably the same as Harrington's *Pterostichus hudsonicus* Lec. from Stupart Bay. A species identified doubtfully as *arcticola* has been recorded from a point near Clyde by Langstaff. *C. arcticola* occurs on Mt. Washington in New Hampshire and has been recorded from Greenland and Labrador by Poppius. The type of the species is said to have come from Greenland.

*Curtonotus brunnipennis* Dej. Port Burwell, Lake Harbour, Clyde, Pond Inlet, Bowman Bay; recorded from Stupart Bay, Cape Chidley, and Cape Digges by Harrington, from Akpatok Island by Blair, and from a point near Clyde by Langstaff. In addition, we have specimens from the following localities situated northwest of Hudson Bay: Yathkyed Lake, Baker Lake, Franklin Bay, Bernard Harbour, Mouth of the Coppermine; from points on the Labrador coast as far south as the Strait of Belle Isle; and from Mt. Washington, New Hampshire. Hayward (1908, Trans. Am. Ent. Soc. XXXIV, 32) records the species from alpine localities in New England and Colorado and from several Alaskan localities. The type of the species came from Labrador. Under the name *borealis* Chd., it is recorded doubtfully from Greenland. The species is variable to a most unusual extent. The variation in color and in the form of the posterior pronotal angles noted by Hayward may be observed in a series from a single locality. In one of the Lake Harbour examples, the posterior supra-orbital puncture is lacking on each side; in another it is lacking on the left side. In the Lake Harbour series the average size is smaller and the color is darker than in a series from Hopedale, Labr. The specimens from Bernard Harbour are considerably smaller and darker than those from Lake Harbour. It is evident that several races or species are included in this material.

*Stereocerus haematopus* Dej. Port Burwell, Lake Harbour, Bowman Bay. We have additional specimens from Bernard Harbour, Mouth of the Coppermine, and Yathkyed Lake, N.W.T.; Hopedale and Nain, Labrador; and from several localities in the Strait of Belle Isle. The type of the species came from Labrador, and published records include Cumberland House and Lake Athabaska in Saskatchewan, alpine localities in the New England states, and Alaska.

*Cymindis unicolor* Kby. (Det. P. J. Darlington, Jr.) Lake Harbour. The species has been recorded from West St. Modest, Labr., Argentine Pass, Colo., and Ungava Bay. The type locality is not given by Kirby. The types of *C. hudsonica* Lec., which according to Horn is a synonym of *unicolor*, came from Methy Lake in northwestern Saskatchewan and from Labrador. Dr. Darlington has given us specimens from Mt. Washington, N. H.

*Hydroporus lapponum* Gyll. Pond Inlet, Nottingham Island, Bowman Bay. We have other specimens from Yathkyed Lake and Bernard Harbour, N.W.T.; Churchill, Man.; Teller, Demarcation Point, and Camden Bay, Alaska. The species occurs in northern Europe and Siberia.

*Hydroporus labradorensis* Fall. Port Burwell, Lake Harbour, Wakeham Bay, Nettilling Lake. The determination has been verified by Dr. H. C. Fall. The type specimens came from Battle Harbour, Labr. The species is very abundant in the region of Hudson Strait. Our specimens agree in every respect except color with specimens of *lapponum* which occur in more northern and more western

localities. The color differences are constant and have been described by Fall (1923, Rev. N. A. Hydroporus and Agaporus, 62). Possibly *labradorensis* should be considered only subspecifically distinct from *lapponum*.

*Hydroporus tartaricus* Léc. This very poorly known species has been recorded by Blair from Akpatok Island. Fall records it from the White Mountains of New Hampshire. The types came from the Lake Superior district.

*Hydroporus glabriusculus* Aube. Recorded from Akpatok Island by Blair. Fall has recorded it from the Lake Superior region, Winnipeg, Man., and Edmonton, Alta., and Sharp from Eastern Siberia and Lapland.

*Hydroporus polaris* Fall. Lake Harbour and Pangnirtung. The types were taken at Bernard Harbour, N.W.T. We have specimens from Demarcation Point, Alaska.

*Hydroporus morio* Aube (= *melanocephalus* Gyll.). Port Burwell, Lake Harbour, Stupart Bay. We have specimens from numerous localities on the north shore of the Gulf of the St. Lawrence, Mt. Albert, Que., Mt. Washington, N. H., and northern Manitoba. The species has been recorded from Hopedale and West St. Modest, Labr., the Lake Superior region, and Virgins Bay, Alaska. It occurs also in northern Europe and Siberia and in Greenland. The synonymy given above follows Balfour-Browne (1936, Ent. Mo. Mag. LXXII, 257).

*Agabus nigripalpis* Sahl. Lake Harbour, Port Burwell, Wakeham Bay, Cape Wolstenholme, Nottingham Island, Nettilling Lake, Pangnirtung, Pond Inlet; recorded from Cape Digges by Harrington. Additional localities represented in the collection are Bernard Harbour and Colville Mountains of Victoria Island, N. W. T., and Barter Island, Cape Collinson, and Teller, Alaska. The types of the species came from Siberia.

*Agabus semipunctatus* Kby. Recorded from Akpatok Island by Blair. We have specimens from Belleville and Trenton, Ont., Edmonton, Alta., and Copper Mountain, B. C. The species has been recorded from Newfoundland, the White Mountains of New Hampshire, Illinois, and Manitoba.

*Agabus congener* Payk. Port Burwell, Lake Harbour. We have specimens from Hopedale and Nachrak, Labr., Strait of Belle Isle, west coast of James Bay, and Mt. Albert in Quebec. According to Sherman, the species occurs above the tree line in the White Mountains of New Hampshire, and it is known from numerous localities in northern Europe and Siberia. It is recorded doubtfully from Greenland.

*Colymbetes groenlandicus* Aube. Port Burwell, Lake Harbour. The species occurs at Nachrak, Labr., and Ungava Bay according to Sherman and is recorded from Greenland, Iceland, and northern Europe by Blair.

### ***Helophorus arcticus* n. sp.**

*Male.* Length 3.3 mm.; width 1.6 mm. Body stout and strongly convex as in *tuberculatus* Gyll. Black; the antennae, palpi, and legs scarcely paler. Head, pronotum and elytra strongly shining, not metallic, clothed with very distinct, stiff, curved setae.

Head more coarsely and very much more closely granulate than in *tuberculatus*. Frontal suture distinct but much less conspicuous than in *tuberculatus*; the clypeus feebly convex, not strongly tumid as in *tuberculatus*. Antennae 8-segmented. Palpi as in *tuberculatus*, short, the terminal segment of the maxillary

symmetrical.

Pronotum seven-tenths as long as wide, widest at apical third and there four-fifths as wide as the elytra; the side margins, feebly and almost evenly arcuate and minutely serrate; the anterior margin rather deeply concave behind each eye as in *tuberculatus*. Pronotal sides distinctly explanate; the disk strongly and almost evenly convex, densely granulate; the granules not umbilicate, not flattened, subequal in size throughout, coarser than in *tuberculatus*. Median line not impressed, very narrowly devoid of granules, this representing the median groove; the external groove represented on each side by an unimpressed, submarginal line which is devoid of granules; the submedian and subexternal grooves entirely lacking.

Elytra widest at middle, the sides moderately arcuate; the disk without impressions, not tuberculate; each interval without evident sculpture and bearing a row of setae; the first (sutural), third, fifth, and seventh intervals slightly but distinctly elevated; the intervals much wider than the punctures of the striae; the elytra without basal series of punctures near the suture.

Supra-pleural area of prothorax wide and polished; not concave but otherwise as in *tuberculatus*. Epipleura and pseudopipleura as in *tuberculatus*. Metasternum and abdomen shining, sparsely and very finely granulate and microscopically alutaceous, the sculpture not concealed by the vestiture. Legs as in *tuberculatus*; the tarsi very short, the fifth segment equal in length to the second and third united.

*Holotype*—Lake Harbour, Baffin Island, August 13, 1935, (W. J. Brown); No. 4050 in the Canadian National Collection, Ottawa.

The species is not closely allied to any known to me. Because of its robust form and dark color, it bears some resemblance to *tuberculatus*, and it agrees with that species in the characters of the palpi and epipleura. In *tuberculatus*, however, the antennae are 9-segmented, and each elytron is impressed, tuberculate, and furnished at base with a short, subsutural row of punctures. The pronotal characters of *arcticus* are remarkable.

*Micralymma brevilingue* Schiodte. Lake Harbour. Recorded from Cocked Hat Island by Strand. All other records of the species are based on examples from Greenland. At Lake Harbour this species occurred abundantly beneath stones that were flooded regularly by the sea during spring tides and during storms. Such is the normal habitat of the species of the genus.

*Olophrum borale* Payk. Port Burwell. Noted from Port Burwell and Akpatok Island by Blair who states that the species has been recorded previously "only from northern Norway, Lapland, and recently from Bear Island." Blair considers *Omalium marginatum* Kby. a synonym of the present species. The type of *marginatum* came from a point on the Mackenzie River near Norman, N.W.T.

*Boreaphilus nearcticus* Blair. Port Burwell, Lake Harbour, Pangnirtung. The types of the species came from Akpatok Island.

*Quedius* sp. M'Lachlan has recorded a specimen taken at Discovery Bay, as *Quedius fulgidus* Erich.

*Mycetoporus* sp. Lake Harbour.

*Atheta* sp. Port Burwell. Blair records a specimen of the genus from Akpatok Island and includes three species of *Atheta* in his Greenland list.

*Simplocaria tessellata* Lec. Port Burwell. We have specimens from Thunder River and Gaspé County, Quebec, and from the Strait of Belle Isle. Under the name *metallica* Sturm., Sherman records the species from West St. Modest, Labr., Mt. Washington, N.H., and Alaska. The type came from the Lake Superior region. By some authors, *tessellata* is considered a synonym of the European *metallica* which is known from Siberia and Greenland.

*Cryptophagus acutangulus* Gyll. M'Lachlan records a specimen from Floeberg Beach. He states that it was taken from ship's rubbish and was undoubtedly introduced with the stores of the expedition.

*Cryptophagus dentatus* Hbst. A specimen is recorded from Akpatok Island by Blair who states that it was undoubtedly introduced with the stores of the party.

*Enicmus minutus* L. Strand records a single example from Alexandra Fjord. Probably adventitious.

*Criocephalus agrestis* Kby. Lake Harbour; recorded from Cape Digges by Harrington. Our three specimens from Lake Harbour were taken in and about the buildings of the Hudson's Bay Company. I believe they emerged from spruce poles that were imported for fire wood during the previous year from Cartwright, Labr. There is not a woody stem in the vicinity of Lake Harbour which is large enough to support the larva of the beetle. The species is recorded by Sherman from West St. Modest, Red Bay, and Hopedale, Labr., and from Ft. Chimo, Que.

*Lepyrus labradorensis* Blair, Port Burwell, Lake Harbour, Cape Wolstenholme. Harrington's *Lepyrus colon* L. from Cape Chidley is probably this species. The types came from Akpatok Island.

## TWO NEW APHIDS FROM MASSACHUSETTS.

BY FORREST W. MILLER,

Amherst College, Amherst, Massachusetts.

### *Drepanaphis sabrinae* n. sp.

Figs. A—I.

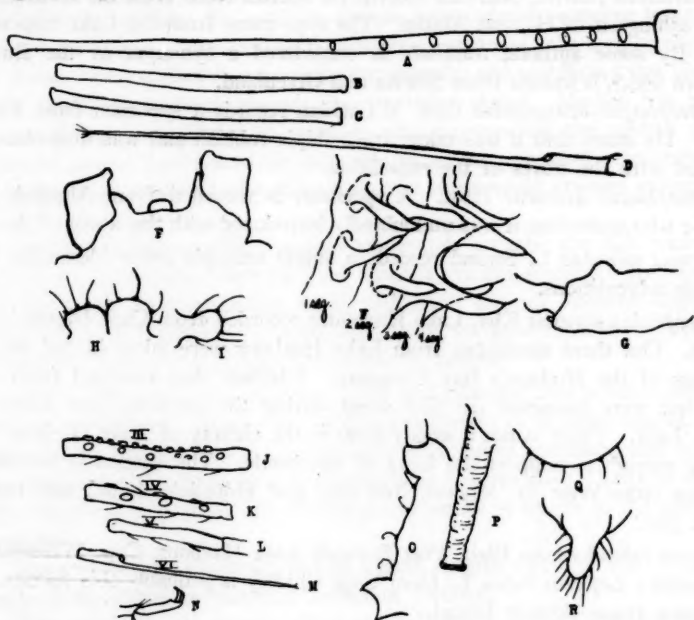
*Alate vivipara*.—Color of head and thorax yellow to very light brown; abdomen pale yellow; cornicles, legs and the antennae concolorous with abdomen.

*Measurements*: Body, 2.14-2.5 mm.; hind tibia, 1.08 mm.; antennal segments, III .80-.97 mm.; IV .51-.58 mm.; V .40-.46 mm.; VI .14 plus .84-.90 mm.; cornicles, .21 mm.

*Structural characteristics*: Vertex slightly convex. Frontal tubercles distinctly developed. Cornicles flanged, tapering and distinctly swollen at base on the dorsal side. Secondary sensoria restricted to segment III, oval, transverse, nine to ten in number on basal one-half of segment. Dorsum with large pair of dorsal tubercles on each segment I to IV inclusive, those on III united at the base, largest on segments III and IV. Hairs inconspicuous and short. Veins of wings clear, dusky only in stigmal area, medial vein twice branched. Rostrum attaining second coxae and obtuse.

*Collections*: Described and drawn from holotype and 26 paratypes taken on the under side of leaves of *Acer saccharinum*, solitary. Collected May 15th, to June 9th. Fairly common in type locality, Amherst, Mass.

**Taxonomy:** Differs from *acerifolii* (Thomas) in dorsal abdominal tubercles, proportional lengths of antennal segments, number of secondary sensoria and altogether lighter in body color.



*Drepanaphis sabrinae*. A. Antenna—3rd segment; B. Antenna—4th segment; C. Antenna—5th segment; D. Antenna—6th segment; E. Head; F. Dorsal abdominal tubercles; G. Femur (distal end.); H. Anal plate; I. Cauda.

*Aphis aba*. J. Antenna—3rd segment; K. Antenna—4th segment; L. Antenna—5th segment; M. Antenna—6th segment; N. Tarsus; O. Head; P. Cornicle; Q. Anal plate; R. Cauda.

### *Aphis aba* n. sp.

Figs. J-R.

*Alate viviparae*.—Head and thorax deep brown with abdomen of a lighter brown tending toward pale red; lateral regions of abdomen with dark brown patches on segments 2 to 8; cornicles and antenna concolorous with head; femur only slightly darker; cauda and anal plate black. *Apterous viviparae*.—Same color pattern as alate except that the antennae are concolorous with abdomen.

**Measurements:** Body, 1.2-1.4 mm.; hind tibia, .65 mm.; hind tarsus, .07 mm.; antennal segments, III .20-25 mm.; IV .12-14 mm.; V .12-14 mm.; VI .07 plus .20-.22; cornicles .23-.25 mm.; cauda, .14 mm.

*Alate vivipara*.—Body, 1.4-1.8 mm.; hind tibia, .82 mm.; hind tarsus, .07 mm.; antennal segments III .24-.29 mm.; IV .19-.21 mm.; V .14-.17 mm.; VI .08 plus .25-.27 mm.; cornicles .21-.27 mm.; cauda .14 mm.; rostrum .65 mm., extending beyond third coxae.

**Structural characteristics:** Secondary sensoria round, scattered over entire length of segment III, 18-22 in number, largely in two rows on posterior side, 4-6 on segment IV and 2-3 on segment V, in alate viviparae, absent in apterae.

Cornicles slightly tapering, imbricated and with distinct flange. Cauda elongated, parallel sides and pointed, with 5-7 hairs to a side (.01 mm. long), and curved at tips. Lateral abdominal tubercles present on thorax and segments 1 and 7 of the abdomen. Fore wings clear, medial vein twice branched.

*Collections*: Found at Woods Hole, Massachusetts, on *Iva xanthifolia* in clusters on leaf stem and leaf midrib. Collections made from June 10th to July 3rd, 1932. Slide No. 43WH.

#### THE BEES OF ALBERTA--IV.

BY T. D. A. COCKERELL,

Boulder, Colo.

(continued from page 89)

##### **Halictus (Chloralictus) richardsoni** sp. n.

*Female*. Length about 7 mm., anterior wing 6.5; robust, without much hair, the abdomen bare and shining, without hair bands, but the mesopleura with rather abundant greyish-white hair; head and thorax dark green, the thorax posteriorly and at its sides almost black; mandibles black, faintly reddish apically; margin of clypeus black; face shining green; mesothorax dark, more bluish green, dull in front, shining posteriorly; scutellum steel-blue, postscutellum black, but metathorax, seen from above, olive green; legs and abdomen black; antennae black; tegulae dark brown, with minute punctures, only seen under microscope; clypeus flattened in middle, with several longitudinal grooves; front dull; vertex shining blue; mesothorax without distinct sculpture as seen under a lens, but with minute rather sparse punctures on a minutely lineolate surface; scutellum strongly gibbous, the elevations shining; area of metathorax large, dull, with a shining margin, plications strong on basal half; posterior truncation sharply bounded; wings conspicuously reddish, stigma and nervures dull red; second cubital cell large, receiving recurrent nervure near end; hair on inner side of hind tarsi pale reddish; hind spur with four very long oblique spines, and a fifth rudimentary one; abdomen without evident punctures, as seen under lens, the microscope shows excessively minute scattered ones.

Wabamun, 60 miles west of Edmonton, July 1, 1935. (Strickland). I had at first mixed this with *H. nigroviridis* Graenicher, from which it is quite distinct by the more robust form and bluer and duller mesothorax. By the punctured tegulae it resembles *H. nymphaearum* Robertson, but that has quite a different abdomen.

Named after Sir John Richardson (1787-1865), who discovered a new *Halictus* (*H. laevis* Smith) south of Lake Winnipeg. In naming Australian and African *Halictus*, I have sometimes chosen to commemorate famous explorers or naturalists of the respective countries. I propose to do the same for Canadian species. The type is No. 4169 in the Canadian National Collection.

*Halictus (Chloralictus) nigroviridis* Graenicher. Bilby, July 4, females (O. Bryant). Described from Wisconsin.

*Halictus (Chloralictus) pruinosis* Robertson. Females. Burdett, Aug. 20 (G. A. Mail); Oyen, Aug. 30 (O. Peck). Described from Illinois.

*Halictus (Chloralictus) disparilis* Cresson. Female, Bow Island, June 30 (H. E. Gray); Male, Lethbridge, Aug. 22 (G. A. Mail).

It differs from *H. pruniosiformis* Crawford by being more robust, yellower green, punctures of mesothorax finer, area of metathorax with strong plicae. *H. lineatulus* Crawford has a much bluer thorax and darker flagellum. *H. zephyrus* Smith has a larger, broader, head and different metathorax. *H. micropoides* Ellis is a quite different, smaller, bluer species. *H. disparilis* was described from Texas, and the Alberta female was compared with specimens from Point Isabel and Runge, Texas. This adds one more to the many cases of southern plains fauna reaching southern Alberta.

*Halictus (Chloralictus) cressoni* Robertson. Female. Edmonton, June 6 (Strickland). Described from Illinois.

### ***Panurginus pecki* sp. n.**

*Male.* Length about 5 mm., anterior wing 4; black, the head and thorax with short dull whitish pubescence; eyes pea-green; face up to level of antennae shining, entirely clear lemon yellow; labrum yellow; mandibles yellow basally, the apical part pale reddish; clypeus convex, without any groove or keel, the punctures not very dense; process of labrum broadly rounded, not emarginate; yellow supraclypeal area small, broader than high; lateral face marks cuneiform, truncate above at about level of top of supraclypeal area, with a very small point extending upward near orbit; antennae entirely black, flagellum long; a polished space on each side of the ocelli; tubercles yellow; mesothorax shining and finely punctured, the median groove distinct; scutellum dullish; area of metathorax a shining crescent; tegulae testaceous, very small; wings dusky hyaline; stigma large, dark brown, nervures pale brown; second cubital cell receiving first recurrent nervure some distance from base; legs black, with knees, tibiae at apex, anterior tibiae in front, and all tarsi light yellow; abdomen with very little hair, margin of tergites shining.

Edmonton, July 29, 1930 (O. Peck). The face-markings resemble those of *P. piercei* Crawford, and in my tables it runs nearest to that species, which is much larger. *P. labrosus* Rob. is larger and has the middle joints of antennae pale testaceous beneath. *P. labrosiformis* Rob. is of the same size, but has narrow lateral marks, and the supraclypeal mark small or wanting, while the mesothorax is coarsely punctured.

The type is No. 4173 in the Canadian National collection.

*Panurginus nebrascensis* Crawford. Beaverlodge, Aug. 9, one male (O. Peck). It differs from the type (described from Nebraska) by the black tubercles, and additional material may show it to be a valid race. Compared with *P. ornatipes* Cresson, it is smaller, with narrower supraclypeal area. From *P. boylei* Ckll. it differs by the yellow stripe on scape, entirely light yellow hind tarsi, and bright red under side of flagellum. The face is like that of *P. boylei*, as regards the pattern of the yellow. For the specific characters of these three species see Crawford, Canad. Entom., Dec. 1912, p. 368.

*Panurginus piercei albertensis* Cockerell. Additional females come from Bilby, Aug. 10 (O. Bryant) and Saskatoon, Sask., where they were taken at flowers of *Grindelia*, Sept. 6, 1936, (K. King and Cockerell).

(to be continued)

NOTES ON THE TYPES OF SOME ICHNEUMONIDAE DESCRIBED  
BY PROVANCHER (HYMENOP.)\*

BY G. STUART WALLEY,  
Ottawa, Ont.

The following is a report on certain specimens of Ichneumonidae found in a small collection of Hymenoptera made by Mr. J. A. Guignard of Ottawa, Ontario, and recently acquired by the writer, for the Canadian National Collection, through the kindness of a relative of the late Mr. Guignard.

Davis (Can. Ent., XXVII, 289, 1895) in a supplementary paper on the Provancher types listed several specimens he believed to be types which he found in the Guignard Collection. Subsequently these specimens disappeared and were not to be found in the bulk of the Guignard material which passed to the National Collection quite a few years ago. In going over the above collection I have been able to locate all the specimens mentioned by Mr. Davis, though as is subsequently shown all of them cannot be considered types.

The labels borne by the specimens are partly in Guignard's and partly in Harrington's handwriting. In no case is there writing in Provancher's or Davis' hand and the word "type" does not appear. The decimal number found on many labels occurs throughout the Guignard collection and probably refers to some private system of cataloguing.

Where specimens are considered types I have so designated them giving them a number and labelling them with the National Collection type labels. Specimens, not types, but considered such by Davis, have been so labelled and placed in the National Collection. The generic position in our present system of classification is given for most of the specimens studied. My report on the material is as follows:

*Stilpnus appendiculatus* Prov. Male, blue label "215"; plain white label "Stilpnus appendicul. Pr. n. sp. 7.4"; plain white label "Hemiteles humeralis teste G.C. Davis." Lacks apex of right antenna, left antenna beyond sixth joint of flagellum and left middle leg. Type No. 4196 in Canadian National Collection.

Davis appears to be correct in placing this specimen as the male of *Hemiteles humeralis* Prov. A specimen compared with the type of *appendiculatus* has been deposited in the United States National Museum.

*Hemiteles mucronatus* Prov. Gahan and Rohwer designated a specimen in the Provancher collection as Lectotype and I see no valid reason for not accepting it as the type. Davis examined a specimen in the Guignard collection, which he considered to be the type. The latter is before the writer. It is probably the same species as the Gahan and Rohwer lectotype although it does differ from Provancher's original description in having the tegulae blackish, not white. Rather, the extreme base of the wing is conspicuously whitish. The specimen studied by Davis is an *Aenoplex* and on the basis of present material appears to be the same as *Aenoplex smithi* (Pack).

*Cryptus ornatus* Prov. Two females are present in the Guignard collection. The one agreeing best with Provancher's description is here designated Lectotype. It bears the following data: blue label "217"; plain white label "Cr. scutellatus

\*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

ornatus Pr. 10.39". The word scutellatus is stroked out and ornatus added below, the correction in violet ink. Both antennae are missing beyond the first segment of the flagellum. Type No. 4197 in Canadian National Collection. The species is here referred to the genus *Hoplocryptus*.

*Cryptus erythropygus* Prov. Female, blue label "218" plain white label "Cr. erythropygus n. sp. 10.40". Pinned with a large pin but otherwise condition good. Type No. 4198 in Canadian National Collection.

This species is Phygadeuonine not Cryptine and is here referred to the genus *Chaeretymma*.

*Cryptus triannulatus* Prov. Male, blue label "223"; plain white label "Cr. 3-annulatus n. sp. 10.51". Badly pinned with thorax damaged, head and front legs glued on, left flagellum, right front wing and all beyond right hind basitarsus missing. Type No. 4199 in Canadian National Collection.

This species traces to *Habrocryptus* in Schmiedeknecht's classification (Opuscula Ichneum, Supp. B. Fasc. IX, XI, 1930-31). According to genotypes this genus should be considered synonymous with *Ischnus* Grav. (Viereck, Type Spec. Gen. Ich. Flies, 1914).

*Cryptus albonotatus* Prov. Male, blue label "231"; plain white label "Cr. albonotatus 10.54". Lacks most of right flagellum and right hind leg, abdomen glued to point. Type No. 4200 in Canadian National Collection.

Apparently best placed in *Spilocryptus* as defined by Schmiedeknecht.

*Cryptus gracilis* Prov. Male, blue label "227"; plain white label "Cr. gracilis 10.52". Lacks apices of middle legs and hind legs entirely except right coxa. Type No. 4201 in Canadian National Collection.

Belongs in *Chaeretymma*. Davis has noted its probable synonymy with *Cryptus rectus* Prov. but until the type of the latter has been studied this cannot be verified.

*Bassus dorsalis* Prov. Gahan and Rohwer designated a lectotype in the Provancher collection, which they state to be a female, as required by the original description. The lectotype has not been studied but in a manuscript note left by H. L. Viereck it is referred to a genus in the Plectiscini. The specimen in the Guignard collection (wrongly assumed by Davis to be the type and referred by him to the genus *Hemiteles*) is a male, evidently Plectiscine, but because of its damaged condition the genus cannot be ascertained.

*Ephialtes variatipes* Prov. Male, blue label "38"; plain white label "Ephialtes variatipes 25. 5. 85" (locality illegible); plain white label "Ephialtes macer teste G. C. Davis". Lacks antennae beyond first flagellar segment. Type No. 4202 in Canadian National Collection.

Belongs in *Ichneumon* (sensu Cushman and Rohwer).

*Phygadeuon guignardi* Prov. Gahan and Rohwer designated a lectotype in the Provancher collection. Davis reported on the type in the Provancher collection (possibly the same specimen) and later on a specimen in the Guignard collection. The writer has studied both the Gahan and Rohwer lectotype and the Guignard specimen and from the notes at hand they appear to be the same species. The last mentioned agrees well with Cresson's diagnosis of *I. mendax* and Davis considered them synonymous. The Gahan and Rohwer lectotype should stand as

type. Until it can be critically studied the synonymy should not be considered conclusive.

## NOTES ON CALIFORNIAN EUPHYDRYAS SPECIES (LEPID.: RHOPALOCERA).

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In the last few years, Lepidopterists have devoted a great deal of interest to the genus *Euphydryas*. This interest, however, has resulted in a great many valid and invalid names, but in little organization or understanding of specific variation and interrelation. Gunder (Pan Pacific Entomologist, VI, 1-8, 1929), in a carefully prepared and well illustrated paper, made the mistake of lumping all American species under five specific names, which is taxonomically incorrect, regardless of genitalic similarities (Pan-Pacific Entomologist, XI, 144, 1935). Others have split the genus into too many species due to the lack of sufficient collecting data. In the present paper, I shall treat the species found in California, where I have collected for many years, and where the great variety of climatic conditions is no doubt responsible for the multiplicity and wide variability of species. Several collections were consulted and a great many genitalic preparations made.

In accordance with the ideas expressed by Ferris and myself (Ent. News, XLVII, 124-128, 1936), I shall use sub-species as the only classification below species. The word "form" will be used in a non-taxonomical sense for either of the above and their phases. I shall not deal with "transition forms" or aberrations, which apparently have no taxonomical or evolutionary significance and the names applied to which should be discarded.

*CHALCEDONA* Dbldy & Hew. This species is generally distributed throughout the lowlands of central California, typical examples coming from the San Francisco Bay region. Almost typical *chalcadona* is found north-east of Sacramento, where it grades imperceptibly to the mountain form *mcglashanii* Rivers, found about Truckee. On the Nevada side of the Sierras, *mcglashanii* and *olancha* Wri. may be caught flying together with any number of intergrades. The occasional presence of red spots in the limbal area on the upper side of the secondaries seems to be a mendelian character in almost all *Euphydryas*. These spots are found, very rarely, in *chalcadona*, and more commonly in *mcglashanii*, *olancha*, *quino*, *perdiccas*, *colon*, and *wallacensis*. Thus, *truckeensis* Gun. is undoubtedly a synonym for *mcglashanii*. At Walker Canyon, about half of the *olancha* are so marked. Unless a locality is found where this form is segregated, *georgei* Gun. must fall synonym to *olancha*. Apparently then, *mcglashanii* (syn. *truckeensis*), *olancha* (syn. *georgei*), and probably *drvinellei* Hy. Edw. are sub-species of *chalcadona*.

*E. cooperi* Behr is considered by most students a synonym for *chalcadona*. Although I have never found yellow caterpillars striped with black, as described for that species, I have raised larvae from Mendocino County which had broad white lateral stripes. The butterflies were indistinguishable from *chalcadona*, whose caterpillars are black, and the larval food plant was the same. The difference in maculation of any developmental stage, if constant enough and if not a

direct result of environmental differences, may warrant specific or sub-specific standing.

QUINO Behr. This insect, as identified by Gunder, must stand as a species until intergrades are found connecting it either with *olancha*, to which it seems most closely related, or to *chalcadona*. Specimens from near San Diego are larger, darker, and marked with much brighter red than those from Palm Springs and the adjacent desert territory.

COLON Edw. *E. colon* must stand as a species unless intergrades are found with *duinellei*, which approaches it. *Colon* does not seem to interbreed with *mcglashanii* in Plumas County or about Lake Tahoe, where both fly. Diamond Lake (Ore.) specimens are smaller and darker than those from central and northern Oregon, and approach *wallacensis* Gun.

SIERRA Wgt. This must be considered a species, since it apparently does not grade to *mcglashanii*, as Gunder believes.

IRELANDI Gun. I am not familiar with the range or variation of this form. Specimens from Big Meadows, Calif., identified as *irelandi* by the author seem to be small very red *sierra*, bearing no relation to the *anicia* group.

WHEELERI Hy. Edw. The insects found about Mono Lake, while definitely belonging to the *anicia* group, do not seem to be typical *wheeleri*. They differ in having a more checkered appearance and rosy red hue. Specimens from Utah come closer to *wheeleri*. Examples from Pyramid Lake, Nevada, are dark and checkered like *maria*.

EDITHA Bdv. This species is found along the California Coast from Sonoma County to San Diego. Specimens from the San Francisco Bay region show a reduction of the red markings on the upper surface, so that they have been mistaken by some collectors for *baroni*. The ground color of the inferior surface of the secondaries is yellowish in the northern examples. In southern specimens, this becomes whiter, and the red areas on the upper surface increases at the expense of the black and yellow. In the mountains of Los Angeles County, the red is of a brighter hue, while in the lowlands from Orange County south, it becomes more of a brown. Southern examples are also slightly smaller than northern ones. All these changes are graduated from north to south, indicating a homogeneous genetic complex, the specimens flying in any one locality showing greater variation than the difference between series from adjacent localities. *Wrighti* Gun. is the name applied to extreme southern examples, and as such may at most be accorded sub-specific rank.

AUGUSTA Edw. *Augusta* must stand as a species, probably arising from the *editha* stem until intergrades between the two are found.

NUBIGENA Behr. *E. nubigena* is one of the most variable and plastic species of the genus. Typical examples are apparently found at altitudes of 7000-8000 feet about Yosemite National Park. They are predominantly orange-red above. They grade to a dwarf form found at still higher elevations in the same area, showing even greater suffusion by the red, which becomes paler and browner. To the east of Tioga Pass, intergrades occur between *nubigena* and *monoensis* Gun. Typical *monoensis* flies at Leevining Canyon, near Mono Lake, and is characterized by the reduction and deeper hue of the red markings, increase of the yellow markings, and slightly larger size. *Fridayi* Gun., which is found within a few

miles of *monoensis*, is distinguished from the latter only by its smaller size, and this factor does not seem to be constant. Typical *nubigena* also flies at high altitudes above Lake Tahoe, where it grades to a form which is very similar to *monoensis* and *fridayi* and flies by the lake shore. North of Lake Tahoe, in Sierra County, almost typical *nubigena* grades to the lower altitude form *aurilacus* Gun., described from Gold Lake, and characterized by its larger size and preponderance of a dark red color above. Examples of this form from still lower altitudes in Plumas County approach very close to *rubicunda* Hy. Edw.

Thus, *monoensis*, *fridayi* (validity doubtful), and *aurilacus* are apparently sub-species of *nubigena*.

**RUBICUNDA** Hy. Edw. This insect must stand as a species until intergrades can be shown between it and *nubigena*. These do not apparently occur about Yosemite, where the two forms fly within a short distance of each other, but may occur in Plumas County if the range of *rubicunda* is found to extend that far north, or about Huntington Lake, where a small form of *rubicunda* has been recorded. The species does fly at lower altitudes about Fresno.

**BARONI** Edw. This seems to be the Coast Range representative of the *rubicunda* stem, differing mainly from that species in the reduction of red maculation. The left (upper) projection of the uncus is almost invariably more curved downwards than in *rubicunda*, *editha* or *nubigena*. *Baroni* does not intermate with *editha* where their localities overlap, and must be considered a species.

**EDITHANA** Strd. This is one of the most interesting species of the genus. Genitally, it differs constantly from butterflies of the *nubigena* stem and from *colonia* by the greater length, slenderness, and curvature of the left hook of the uncus, in these respects showing closer relationship to *baroni*, from which it also differs. Typical *edithana* is found sparingly in Lassen, Trinity, and Siskiyou Counties, and probably the adjacent parts of Oregon. Specimens from Diamond Lake, Ore. have genitalia typical of *edithana*, but are smaller and predominantly dark red above, so that they look like dark *nubigena* or small *aurilacus*. Only 5 to 10 per cent agree with typical *edithana* in maculation. They also vary somewhat in size, grading to the dark alpine form *lawrenceii* Gun., found on Mt. Thielsen, by the shore of the lake. In this light, *lawrenceii* is probably a sub-species of *edithana*.

## RESEARCH NOTES

### RECORDS OF NORTHWARD MIGRATION OF SOUTHERN INSECTS DURING DROUGHT YEARS.

During the period of severe drought in the great plains from 1931 to 1936 insects of this region have shown a marked tendency to extend their range to the north and east and to increase in regions where they had previously been rare. Dr. Harry H. Knight (1936, Ann. Ent. Soc. Am. XXIX, 578) has recorded this in Iowa and has mentioned how climatic factors apparently cause species to have a fluctuating range of 300 to 500 miles. This migration has also been noted in Manitoba at the north-eastern extremity of the great plains where the following records were made.

**HEMIPTERA**—The boxelder bug *Leptocoris trivittatus* Say. is mentioned by Knight "as becoming unusually abundant during the drought." This was also noted in Manitoba where very large swarms congregated for hibernation in the

autumn of 1936.

ORTHOPTERA—*Aulocara elliotti* Thomas.—This economic species "has eastern limits of Center and Hazelton, N. D., Turtle Mountains, Man., and Lethbridge, Alta." (1936, Tech. Bull. 284, N. Dak. Agric. Exp. Sta.). In 1936 it was common at Lyleton, Man. and a single male was taken at Arnaud on Aug. 3, by H. W. Moore.

*Metator pardalinus* (Saussure).—Hebard states "Max, the Killdeer Mountains and Williston, N. D., and Luverne, Minn., are northern limits; the latter and Dickinson and Plymouth Counties, Iowa, being eastern limits for this handsome species of the Great Plains, which until the recent receipt of specimens from Minnesota and Iowa, was not known to occur nearly so far east." In 1936 it was taken for the first time in Manitoba and occurred commonly along the whole southern portion of the province as far north as Brandon and east to Carlowrie.

LEPIDOPTERA—The Pyralid, *Homoeosoma electellum* (Hlst.) is a pest of sunflowers in Iowa and Minnesota. In 1935 it was first found in Manitoba, near Morder, by Mr. R. H. Painter where it was causing extensive damage. A report also came in from near Brandon. The insect was generally distributed over southern Manitoba in 1936 and not only attacked sunflowers but garden compositae, cosmos and zinnias, as well.

The corn ear worm, *Heliothis obsoleta* Fab., has been recorded in Manitoba a number of times but in 1934 an unusually large number migrated into the province and caused considerable damage north to Brandon.

The painted lady butterfly, *Vanessa cardui* L., occurred in large numbers in 1935 and did considerable damage to hollyhocks.

SIPHONAPTERA—The human flea, *Pulex irritans* L., was found to be heavily infesting coyotes near Brandon in the fall of 1936. According to Mr. C. R. Twinn, this is the first record of this insect from Manitoba and the first record of it attacking coyotes in the Dominion.

R. D. BIRD.

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## NEWS AND VIEWS

### RECENT DEATHS

It is with considerable regret that we record the deaths of two well-known entomologists in the United States.

Dr. W. H. White, of the United States Bureau of Entomology, passed away suddenly at Moorestown, N. J., last month (April), in his 63rd year. He was buried, with military honours, in Arlington Cemetery.

Professor William Morton Wheeler, professor emeritus of Entomology at Harvard University, died suddenly, in his 72nd year, on April 19th.

Mailed Saturday, June 5th, 1937.

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